

Res Bailey

76038

Cruise Report

R/V H.J.W. FAY 025

September 21, 1976 to October 10, 1976

Rec'd 24 NOV 76

ROSCOP 29 NOV 76

John Grow, USGS
USGS
17 Nov. 1976

Vessel: R/V H.J.W. FAY

Ports: Woods Hole to Woods Hole

Dates: September 21, 1976 - October 10, 1976

Personnel:

John Grow	Chief Scientist
Perry Parks	Navigation/Gravity Engineer
Ralph Lewis	Navigation Watch Stander (0-4 Hrs)
Barry Irwin	" " " (4-8 Hrs)
Pete Popenoe	" " " (8-12 Hrs)
Nick Lefterioux	Seismic Systems ET
Al Goodman	" " "
Dennis Edwards	Airgun/Compressor Watch (0-8 Hrs)
Bill Jaworski	" " " (8-16 Hrs)
Dave Kinney	" " " (16-24 Hrs)
Debbie Doyle	Seismic Recorder Watch (0-4 Hrs)
Peter Johnson	" " " (4-8 Hrs)
Dave Forrer	" " " (8-12 Hrs)
Sandy Conally	Cruise Data Curator

Ship's Crew:

Peter Olander	Captain
Tom McSherry	Mate (0-4 Hr)
Mark Maloof	Mate (4-8 Hr)
John Sullivan	Mate (8-12 Hr)
Larry Weeks	Chief Engineer (8-12 Hr)
Charles Baptist	First Engineer (4-12 Hr)
Leo Rowe	Third Engineer (0-4 Hr)
Wayne Kates	Oiler

George Dorsey	AB (0-4 Hr)
Don Marshall	AB (4-8 Hr)
Charles Greenland	AB (8-12 Hr)
Henry Roef	Steward
Wayne Bailey	Messman
Mike Field	Bedroom Steward

Cruise Objectives:

FAY 025 was a geophysical cruise to collect airgun, minisparker, gravity and magnetic data on the Blake Plateau (Fig. 1 & 2). Six specific tasks were planned.

(1) Fault Survey

A detailed survey of 6 to 8 NW-SE lines and 3 NE-SW lines of about 50 mile lengths over a fault was needed at the eastern edge of the Blake Plateau. The fault had been detected on multichannel seismic line BT-1 (Fig. 3).

(2) Airgun Line from DSDP Site #391 to North of Blake Outer Ridge

A deep-water airgun line running from North of the Blake Outer Ridge, across the ridge and down to Deep-Sea Drilling Site No. 391 was needed to trace deep-sea horizons A, A*, Beta, and basement from the well up into the continental rise of Cape Hatteras where the ages of the deep reflectors was uncertain.

(3) Gravity lines on Southern Blake Plateau

Two or three gravity lines on the southern part of the Blake Plateau were needed to complete a new gravity map for that region which is in preparation. The northern of these lines passed over D.S.D.P. Site 390 on the Blake Spur (Fig. 2) and was also designed to tie the Cretaceous horizons drilled there into other seismic lines in the central portion of the plateau.

(4) Minisparker line along inner Blake Plateau

A minisparker profile from Glomar Conception drill site #6004 (Fig. 1) up to a Caldrill site 5 was run to tie the seaward ends of lines previously collected on the FAY 017 cruise,

(5) Buoy Deployment

A last minute addition to the agenda included deploying a marker buoy off New Jersey at a site were one of the Glomar Conception drill sites (Fig. 1)

(6) Gravity Data over Multichannel Seismic Lines 12 and 13

The R/V FAY proceeded at full speed with no streamers deployed between Woods Hole and the primary survey areas on the Blake Plateau, but the track down followed multichannel line #12 and the line back followed line #13 in order to obtain gravity data (Fig. 1).

Instrumentation - (See FAY 019 cruise report for additional details)

(1) Single-channel airgun reflection system.

Two airguns, 80 and 160 in³ Bolt PAR 1900C, were fired on 10 second intervals for most of the cruise. The data ^{were} recorded on a 5 second sweep with two Raytheon dry paper recorders and on a 7 track Honeywell analog tape unit. The sweep delays varied from 0 to 4.9 seconds depending on the depth of water, Filters were usually 16-60 hertz. The streamer was a Seismic Engineering unit with acceleration cancelling hydrophones. Excellent penetration of 3 to 4 1/2 seconds was achieved in deep water where multiples were not a problem,

(2) Teledyne Minisparker

A 600 joule sparker was used to obtain water bottom depths and penetration in the first half second of the sub-bottom layering. The data was filtered between 280 and 1060 hertz. Excellent results were achieved in almost all areas, with the exception of portions of the

Outer Ridge where sand waves on the bottom (>4000 m depth) diffracted the signal badly.

(3) Magnetic Gradiometer

A two trace Geometrics magnetic gradiometer was employed for all tracks south of Cape Fear. The master proton procession magnetometer was towed 1500 ft. behind the ship while the slow magnetometer is towed on the same cable at a distance of 1000 ft. behind the ship.

(4) Gravity System

A vibrating string accelerometer mounted on a Sperry Mark 19 three axis gyrostabilized platform was employed for gravity data. A failure in the string frequency filter on September 30th caused a temporary loss of data.

Repairs were made with a different filter. The new filter worked well after course and speed became stable, but took up to 1 hour to stabilize after 90 degree turns. The data appeared good, but some care will be needed in editing data after turns for the latter half of the cruise.

(5) Integrated Navigation System

Navigation systems include a Teledyne Loran C (for both Range-Range and hyperbolic positions), Magnovox Satellite receiver, Sperry Mark 29 gyro, and Chesapeake speed log integrated into a data acquisition computer (Hewlett Packard HP-21 MX) with dual 9 track magnetic tape recording. All subsystems performed extremely well during the cruise. Range Range Loran was the primary system unless transmission or base-line problems occurred. Hyperbolic loran and gyro systems were used as secondary systems. Reliable satellite fixes were generally within ± 500 feet of either Range-Range or hyperbolic loran positions. Gyro positioning was generally only used for an hour or less, but sometimes got off by 1 or 2 miles if strong currents were present (this can be improved by post cruise interpolation). Overall, the INS worked

beautifully the entire trip.

Chronological Log - FAY 025

The ship departed Woods Hole at 7:22 P.M. EDT (2322Z) on 21 September 1976. Exiting southwest through Vineyard Sound the ship headed south to where it intersected multichannel seismic reflection line #12, and then it continued southwest along that line at full speed while collecting gravity data (Fig. 1).

During 1800-2300~~07~~/22 September 1976, the R/V FAY moved slightly off CDP line #12 and deployed a marker buoy (5 ft. diameter, orange) at 39°25.20'N and 73°35.46'W (about 30 miles east of Atlantic City, New Jersey). The position corresponded with Loran C readings of 40182.2 and 70178.3 microseconds. The buoy was deployed to mark the site of a buried pipe where the Glomar Conception had drilled a hole in early September and broken off its bottom hole assembly.

After departing the buoy site, the FAY continued south at full speed along CDP line #12 until past Cape Hatteras and just north of Cape Fear. At 1530Z/ 24 September, the R/V FAY turned southeast, slowed and deployed the airgun, minisparker and magnetometer systems. Line #1 (Fig. 2 & 3) led across the Blake Plateau into the area for the fault survey. That survey continued until 2112Z/ 28 September during which time lines # 1 through 11 were completed. The fault was found to be 40 to 50 km long and trend at about N25°E. A diapir structure was also found at the southeast end of the fault survey (Fig. 2 & 3).

Line 12 was run to the northeast in order to tie into previous lines from FAY 019. Lines 13 and 14 (Fig. 2) crossed the Blake Outer Ridge and continued south to D.S.D.P. Site #391. Excellent quality records all the way down to basement were obtained along the entire line.

After crossing D.S.D.P. site #391 at 0407/2 October 1976 the FAY headed west to begin a series of east-west lines (#15 to 21, Fig. 2). Line #20 crossed deep-sea drilling site #390 and then detected a major fault with several hundred meters of offset at the western edge of the Blake Spur.

Between 0130Z/7 October and 0030Z/8 October the FAY ran a line primarily for minisparker data between Glomar Conception drill site 6004 and a Caldril site 5 east of Cape Fear.

After that the FAY pulled all streamers and headed toward Woods Hole along C.D.P. line #13.

The FAY reentered Woods Hole at 7:30 A.M., E.D.T. (11307) on Sunday, October 10, 1976 to complete FAY cruise 025.

Throughout this entire cruise the weather was perfect. Winds hardly ever exceeded 15 knots and seas never exceeded three feet.

The performance of the scientific staff and equipment was excellent.

The cooperation of Captain Peter Olander, Chief Engineer, Larry Weeks, and the crew of the R/V FAY was outstanding and contributed greatly to the success of the voyage.

Scientific Results

A. Fault Survey

The fault which had been detected on C.D.P. line #BT-1 was found to terminate between 10 and 20 km north and between 30 to 40 km southwest of BT-1. It's trend is N25°E and the maximum offset appears to be about 100 m at a subbottom depth of 1 km but decreasing to 5 m or less in the upper 100 m of the section. A few smaller faults with offsets of 10 to 20 m may exist but they are not continuous between the grid lines (6 mile spacing).

The fault occurs at the edge of the Blake Plateau where the Northwest end of the Blake Outer Ridge meets the plateau. The Blake Outer Ridge has been shown to be a sedimentary structure which has built rapidly during the Tertiary period (post-Horizon A). The fault is likely to be a result of isostatic loading of the oceanic crust with the large weight of sediments contained in the Blake Outer Ridge.

B. Diapir

During the fault survey a diapir which comes from beneath Horizon A and pushes up surface sediments was found at 32°30.3'N and 76°11.6'W. No magnetic or gravity anomaly is associated with the structure. It is probably composed of either salt or shale.

C. Profile over Blake Outer Ridge to D.S.D.P. Site #391

Although good penetration to basement was achieved along this entire line, the continuity of horizons A, A* and B was not necessarily clear. A careful analysis of the line will be necessary to establish if all horizons can be traced from D.S.D.P. site #391. Horizon B was not a prominent reflector on our record at site #391, but still could be traced to north of the Blake Outer Ridge.

D. Blake Spur Faults

On line #20, two apparent faults were detected, one at the base of the escarpment and one near the western edge of the Spur. Several hundred meters of displacement has occurred. Since shallow water reefal material of Neocomian Age (118 m.y.) was drilled at 2.9 km depth at D.S.D.P. Site #390, the fault appears to have been related to the subsidence of the Spur.

E. Westward Dipping Horizons Beneath Blake Plateau

Lines 16, 18 and 21 show that horizons dip gently toward the west. The Tertiary section on the Blake Plateau is thought to be less than 500 meters and therefore these westward dipping beds must be Cretaceous in age. This contrasts with the generally seaward dipping trend seen north of Cape Hatteras. Lines 16 and 18 also show these westward dipping beds coming into a broad gentle arch which lies at the outer edge of the Plateau.

FAY 025 Data Summary

200Z n.mil.

Gravity Data 5560 km--Continuous, Woods Hole to Woods Hole except brief period on 30 September

Airgun 3310 km 1787 n.mil.

Minisparker 3310 km "All operated simultaneously from 1600Z/24 Sept. to 0030Z/8 Oct.

Magnetometer 3310 km "

Fig. 1 - Track Map $35\frac{1}{2}^{\circ}$ - $41\frac{1}{2}^{\circ}$ N and 70° - 77° W

Fig. 2 - Track Map 28° - $35\frac{1}{2}^{\circ}$ N and 72° - 82° W

Fig. 3 - Detailed Track Map of Fault Survey 32° - $33\frac{1}{2}^{\circ}$ N and 75.8° - 79.5° W

Figure 1

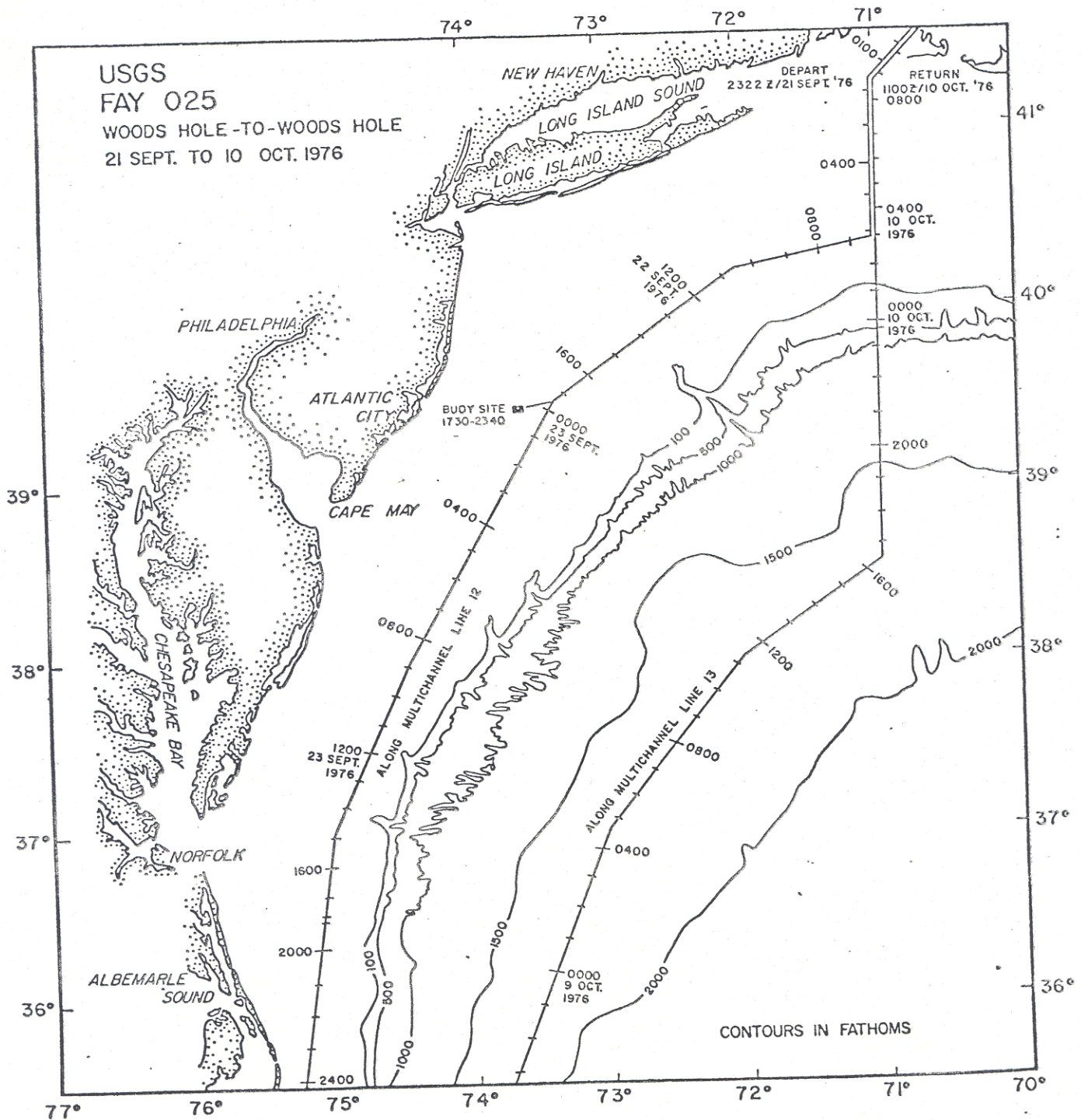


Figure 2

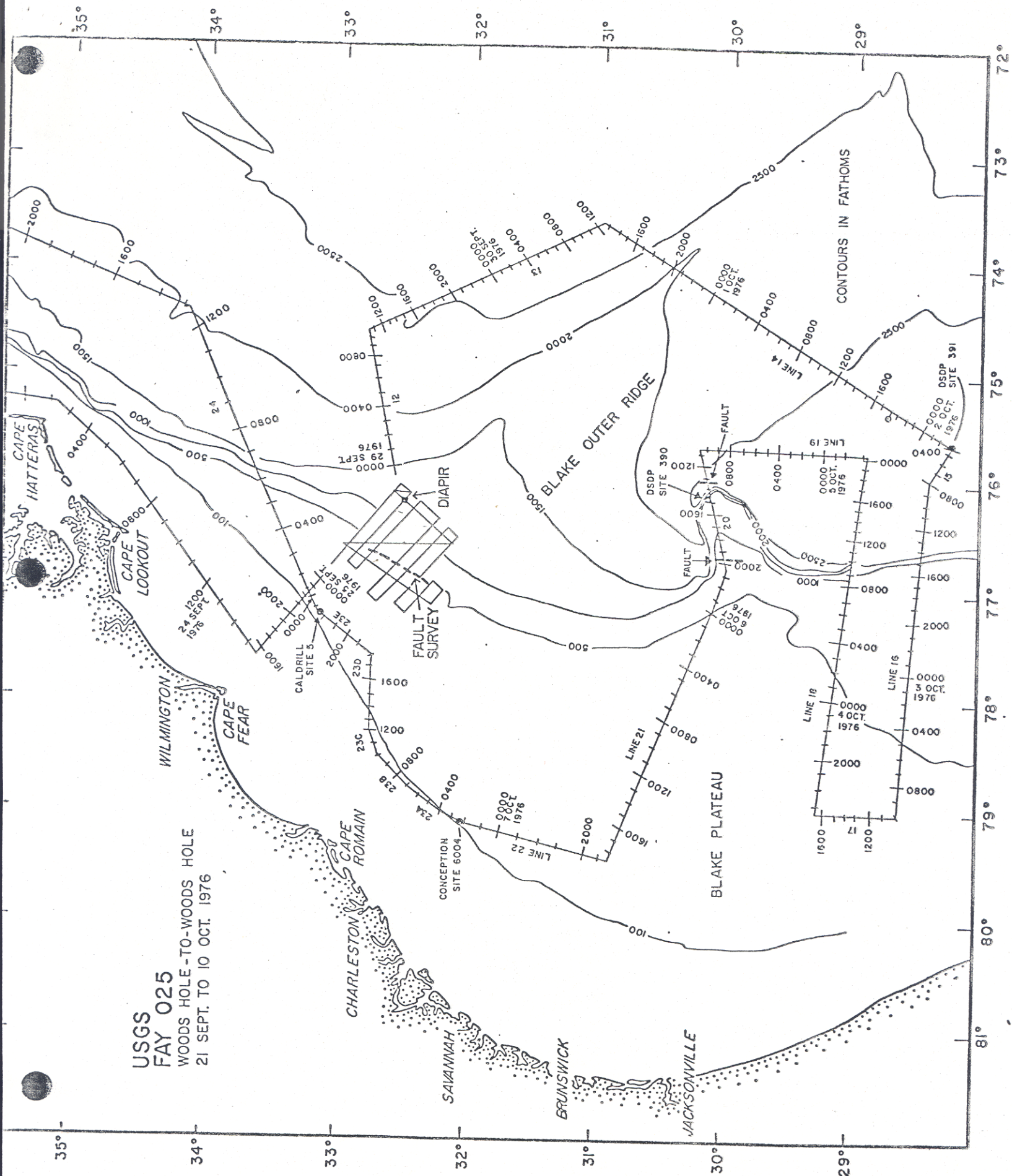


Figure 3

